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ABSTRACT
Although house prices and wages are both influenced by distinct factors that shape their own evolutions, they are also intrinsically connected through house price affordability. Further, macroeconomic policies centred around adjustments in the mortgage rate are of prime importance in ensuring that the housing market does not overheat. This study contributes to the understanding of the link between housing market affordability and mortgage rates by investigating this association across regions of New Zealand using quarterly data between 2000 and 2017. Applications of trajectory regression reveal that the global financial crisis affected regional house price affordability asymmetrically and there was no statistically significant correlation between house price affordability and mortgage rates.

INTRODUCTION

Housing affordability is recognized as an increasing problem for many cities and countries around the globe (Baker, Bentley, Lester, & Beer, 2016; Voith & Wachter, 2009). The reasons for such concerns are in part the result of the exponential house price growth in urban areas since the turn of the century (Harvey, 2012). Affordability at the urban scale can also affect affordability concerns at the regional scale and contribute to a national picture of affordability drivers and dynamics. Affordability has thus become a key governmental policy concern for many countries at national and regional levels.

One lever to control house price growth is perceived to be in the setting of interest rates (Hubbard & Mayer, 2009). For instance, the rationale for exploring the relationship between interest rates and affordability is grounded on the dominant view that house price growth is controlled in some way by the setting of interest rates (Iacoviello, 2005). Interest rate changes influence patterns of spending and saving, and thus affect housing decisions such as choosing which assets to invest in (Damen, Vastmans, & Buyst, 2016).

This paper presents an analysis of house prices, wages and mortgage rates, plus adds to the affordability debate (Matlack & Vigdor, 2008), predominantly through a focus on regional

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spatial differences in affordability, and the relationship between house price affordability and mortgage interest rates. We apply trajectory regressions to identify whether regional house prices move similarly over time to assess the impact of mortgage rates on regional house price trajectories, and to consider any asymmetric impacts of the global financial crisis on house price affordability across regions (Crotty, 2009). Drawing on these results, we consider whether monetary policies based on mortgage rates affect house price affordability. The aim of the paper is to improve the understanding of some of the constituent factors and variables that are arguably contributing to housing affordability. More specifically, house prices, wages and mortgage interest rates. We seek answers to the following research questions:

- Has house price affordability consistently reduced over time?
- Are there groups of regions that follow different house price affordability temporal paths?
- Did the 2007/08 global financial crisis affect each regional grouping equally?
- Do mortgage rates consistently affect regional house price affordability?

Our empirical case study focuses on the regions of New Zealand, which includes the highly unaffordable city and region of Auckland that is ranked seventh in the world as a city for unaffordability (Demographia, 2019). When aggregating regions at a national scale, we see evidence that New Zealand is experiencing affordability concerns with a house price to income ratio of 8.5 (Real Estate Analysis Unit (REAU), 2019) and increasing house prices that have made housing unaffordable for many (Murphy, 2014, 2016). Nevertheless, the housing stock in New Zealand has, over the last 10 years, been a relatively safe place in which to invest, and with rates of return in housing investments being on a par with or surpassing other investments (Cerutti, Dagher, & Dell'Ariccia, 2017).

LITERATURE

Affordability is complex, it can have many determinants and multiple normative and positive economic meanings. Normatively, individuals and households ought to be able to purchase a certain property (Kuang & Li, 2012), and in a positive economic sense it is where empirical 'facts' illustrate affordability using some statistical technique (Meen & Andrew, 2008). For example, examinations of house price growth reveal spatial and temporal ripple effects at the regional scale, which reminds one that sub-regional scales are of importance when analysing highly aggregated data sets (Meen, 1999). The spatial statistical approach adopted in this research emulates studies that consider growth clusters and spillovers of house price growth without direct commuter migration determinants. For this paper we align with Gray (2012), who uses a singular regional–national segmentation, although we focus on affordability and mortgage rates rather than on house prices. Quantifying affordability is useful to improve one's understanding of affordability, and appropriate measures have included ratios (e.g., income–house price ratios), residuals (e.g., residual disposable incomes, after housing costs have been subtracted from gross incomes) and costs (e.g., total housing costs) (Bourassa, Hoesli, & Sun, 2006; Gan & Hill, 2009; Stone, 2006).

Since the 1990s, research has argued that affordability is driven (in the UK) by changes in, *inter alia*, demography, income distribution, housing supply, tenure and an important long history of financial deregulation (Bramley, 1994). More recent determinants of affordability include the pressure from investors who own multiple properties beyond the primary residence (Jordà, Knoll, Kuvshinov, Schularick, & Taylor, 2017). Austerity and poor performance in other financial assets has led to cuts in pensions in several countries, which has stimulated demand for housing because it is viewed as a relatively safe alternative asset (Austin, Gurran, & Whitehead, 2014), and the established view is that sustained low interest rates since the global financial crisis have

incentivized consumers to invest in home ownership rather than in other assets (Squires & White, 2019).

Prominent in the literature has been a change in the language and subject matter surrounding affordability that used to focus more squarely on housing need (Whitehead, 1991). Increasingly the affordability decision to purchase a house is associated with the status that is conveyed on the purchaser through different levels of positive status effects associated with location and property quality (Foye, Clapham, & Gabrieli, 2017). Ownership of a second home is also increasing in New Zealand and provides a second source of income for many (Eaqub & Eaqub, 2015). The desire for greater social standing afforded by home ownership may make relative unaffordability tolerable and higher mortgage repayments worthwhile, and hence attenuate the moderating effect of mortgage rates on house price affordability.

Housing affordability connects to ideas on affordable housing. Affordable housing tends to focus on the supply of affordable housing, rather than the result of an interplay between supply and demand for housing. Further, market intervention in the supply and demand of housing are construed as making them affordable to low-income groups (Galster, 1997). A demand heavy approach to affordable housing is critiqued as it may detract from the importance of structure and delivery of subsidies, and the particular contexts within which markets operate (Yates & Whitehead, 1998).

Housing affordability remains a key socioeconomic and political concern in New Zealand (Murphy, 2014). Public housing is intended more for those in need (Johnson, 2017) and it is provided institutionally by the Housing New Zealand Corporation (2017). The year 2017 signalled an increase in attention towards the public provision of housing and commenced with a baseline stocktake, as commissioned by a new Labour-led coalition government (Johnson, Howden-Chapman, & Eaqub, 2018). Ministries contributed resources to housing affordability through Public Housing Assistance (PHA) via the Ministry for Social Development (MSD) (2017) and intellectual oversight on affordability from the New Zealand Productivity Commission (NZPC) (2012). The private rental sector is becoming more prominent in New Zealand as an affordable tenure option, especially as the owner–occupier market is becoming out of reach for many (BRANZ, 2017). Moreover, the rental sector has subsequently seen a rise in take up of Maori and Pacific groups (Statistics New Zealand, 2016). Interestingly and less polarizing are arguments that a quasi-market approach is needed in New Zealand to deal with the socioeconomic and spatial components of housing (Dykes, 2018).

Affordability, monetary policy and interest rates

In the academic literature that explores housing affordability policy, most themes cut across a traditional divide in macroeconomic policy in being either fiscal, regulatory or monetary (Glaeser & Gyourko, 2003). Fiscal subsidy interventions to enable housing affordability include public payments to housing suppliers and to urban renewal housing programmes (Rosen, 1985; Gibb & Whitehead, 2007). Public spending, tax credits or cross subsidies (e.g., from other tenants and/or landowners/developers) appear to be in decline globally, particularly as a proportion of the overall housing subsidy (Kim & Renaud, 2009). Regulatory approaches in the strictest (rather than hybrid) sense include interventions that enforce quality standards, licencing, inclusionary/exclusionary zoning, non-discriminatory laws and rent controls. This command-and-control approach to housing affordability is extended in planning frameworks (Austin et al., 2014) that can change land-use designations to open and close instantaneously the supply of more housing (Beer, Kearins, & Pieters, 2007).

Monetary policy affects house price affordability through, *inter alia*, interest rate adjustments and a forced increased flow of credit. Housing collateral and downpayment constraints (loan-to-value rates) are key to understanding the role of house price variations (Muellbauer & Murphy, 2008). Other more innovative monetary policies include the creation of bonds to fund the (re)

development of affordable housing (Squires & Hutchison, 2014). The dominant perception is that changes to the interest base rate (and subsequent mortgage interest rate) will have an impact on whether investors (including homeowners) can afford to invest more in housing. In theory, higher rates will have a dampening effect on the housing market, and subsequently affect house price affordability (Zhu, Betzinger, & Sebastian, 2017).

The position and impact of interest and mortgage rates in New Zealand are often used to demonstrate why demand for purchasing property is high, and how interest rate setting can be a policy tool to dampen housing market demand (RBNZ, 2019). Literature in this field indicates that New Zealand has some interesting differences in housing affordability and policy to those internationally. For instance, compared with the United States, New Zealand's housing affordability is more dependent on the owner–occupier market (Lawson & Milligan, 2007; Skidmore, 2014). There are also serious, consistent and rising spatial concerns over house price affordability in New Zealand over the last two decades around the dominant region of population and employment (Auckland) and around the dominant region for tourist-related home investments (Central Otago Lakes, centred around Queenstown) (REAU, 2019).

Macro-prudential policies centre on the concern that New Zealand has one very large house price bubble (Fraser, Hoesli, & McAlevey, 2008) and is particularly prominent because the global financial crisis of 2007–08 has not been documented as having a significantly trigger for a steep housing market decline that was experienced by other countries (Claessens, Dell'Ariccia, Igan, & Laeven, 2010; Martin, 2011).

What is not clear in the New Zealand related literature is how housing affordability can be achieved through specific policy mechanisms, and particularly whether monetary policy has an ability to control housing affordability due to the dominance of Australian banks in the New Zealand banking system (Murphy, 2011). With these issues in mind, we postulate that house price affordability may be insensitive to interest rates, albeit to varying degrees across New Zealand regions, and hence any claims that monetary policies (and specifically mortgage interest rates) affect house price affordability are predominantly weak.

DATA

Data were drawn from the REAU, Massey University, New Zealand, which collated data over the last two decades for its quarterly Home Affordability Report (HAR) (REAU, 2019). Its data set contains quarterly observations for 12 regions between 2000 and 2017 inclusive in aggregate at two strictly hierarchical spatial scales: regional and national. Average weekly earnings and mortgage interest rate figures were drawn from Statistics New Zealand and the Reserve Bank. House price data were sourced from the Real Estate Institute of New Zealand (REINZ, 2019). To generate an affordability index for the purposes of this paper, we divided average wages by house prices. This affordability index provides a reliable and useful statistical summary, where the lower the index value the more unaffordable the housing. For instance, if the housing affordability value changes from 0.250 to 0.125, then instead of taking four years (1/0.250 = 4) of full pay to pay for the house, it would now take eight (1/0.125 = 8) years. This housing affordability index allows for interregional comparisons and changes over time and explicitly incorporates regional average house prices and regional average wage levels.[1]

Median dwelling prices for various regions within New Zealand were released monthly by REINZ. Figures were obtained from a survey of member agencies' sales during that specific month.[2] Average national and regional weekly earnings data were provided directly by Statistics New Zealand. The interest rate data is based on Reserve Bank of New Zealand (RBNZ) two-year fixed new residential average mortgage interest rates at the end of month for registered banks.
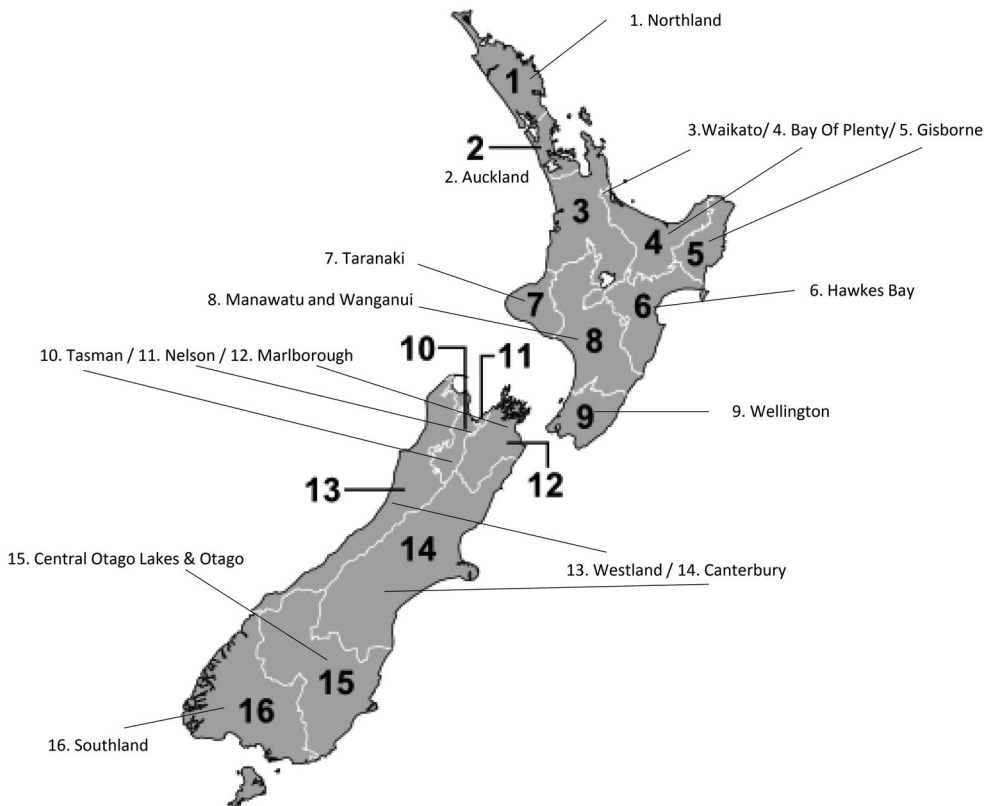
Figure 1. New Zealand's 12 regional boundaries used for analysis.
Source: Adapted from Wikimedia Commons (2019).

Regional councils have administrative regional boundaries, as shown in Figure 1. To match the REINZ aggregate, regional statistical geographies of some of the administrative boundaries are joined or split. REINZ joins regions when functional housing markets are similar to and juxtapose each other; these joins result in the following 12 statistical regional groupings for analysis in this paper: Northland, Auckland (labelled also as Auckland/Thames/Coromandel), Waikato/ Bay of Plenty/Gisborne (combined), Hawkes Bay, Taranaki, Manawatu/Wanganui (combined), Wellington, Nelson/Marlborough/Kaikoura (combined – and labelled in Figure 1 as Tasman, Nelson and Malborough), Canterbury/Westland (combined), Southland, and Otago. One further difference in the statistic groupings is a splitting of Otago to have two regions of Central Otago Lakes and Otago. This split denotes the significant difference in functional housing markets, and particularly the relatively higher priced Queenstown in Central Otago Lakes region relative to the lower priced Dunedin in the Otago region.

METHODOLOGY

This study aims to improve understanding of the constituent factors and variables that are arguably contributing to housing affordability. Here we explore house price and wage affordability spatial asymmetries in New Zealand and uncover whether affordability has a strong relationship with mortgage rates. We do this by posing the following research questions:

- Has house price affordability consistently reduced over time?

- Are there groups of regions that follow different house price affordability temporal paths?
- Did the 2007/08 global financial crisis affect each regional grouping equally?
- Do mortgage rates consistently affect regional house price affordability?

We select a methodology that enables the identification of groups of regions whose house price trajectories follow similar paths of time. To do this, we identify the presence, magnitudes and significance of interregional and evolutionary disparities in house prices across all regions of New Zealand using quarterly data between 2000 and 2017. We also require that the chosen methodology reveals the influence of mortgage rate adjustments of various lag lengths and the global financial crisis on the trajectories of those regional groups. Although this is not a trivial undertaking, a method that permits the identification of these patterns is Nagin's (2005) trajectory analysis. Nagin's group-based trajectory approach is implemented here to identify if distinctive groups of regions follow similar affordability trajectories, to explore these affordability trajectories themselves and, most importantly, to ascertain whether there are groups of regions that experience similar housing affordability outcomes.

A priori selection of groups of regions that follow similar affordability trajectories may not be appropriate because of the inability to calibrate with precision the membership of such groups. Thus, latent group-based trajectory modelling, which can chart the developmental course of house price affordability and assess heterogeneous regional responses to policy interventions, was used to identify regional groups and their varied trajectories over time. Rather than assuming that the distribution of regional trajectories varies continuously and in a fashion that can ultimately be explained by a particular multivariate distribution, applications of Nagin's approach to house price affordability necessarily assumes that there may be distinctive developmental trajectories that can be detected.

As all methods have their strengths and weaknesses, it is worth mentioning that one restriction of the group-based approach is that the number of groups must be specified in advance, although a diagnostic test can be used to identify an optimum number. However, there is debate about how to use test statistics to determine the number of groups to include in the model as well as the specification of the order of the polynomial equation used to represent the shape of each group's trajectory (Ghosh & Sen, 1984; Titterington, Smith, & Makov, 1985). Other methods used in housing economics that look at convergence and unit roots, such as augmented Dicky–Fuller and similar, tend to explore the lag length in a series rather than model differing trajectories.

The novelty of Nagin's (2005) group-based modelling trajectory approach is threefold. First, the groups of regions with distinctive house price affordability trajectories are not defined a priori but instead are conceived as *latent* and to be identified. This inductive approach has considerable value for pattern identification. Second, membership of groups is conceived probabilistically but not as an all-or-nothing deterministic outcome. In our case, the results show the probability that each region belongs to their respective identified group. Third, identification and estimation of groups, trends, probabilistic group membership and functional relationships are undertaken simultaneously and not via a sequence of separate models. This permits the estimation of a goodness-of-fit measure corresponding to the overall model and individual parameter standard errors estimates to indicate the degree of uncertainty.

The model is appropriate for data with averages that change relatively smoothly as a function of the polynomial of time. Sharp changes can be handled through the inclusion of time-dependent covariates with dummy variables representing a regime shift, and these may be appropriate if, for example, the global financial crisis created a detectable shock to house prices and their affordability around 2007–08.
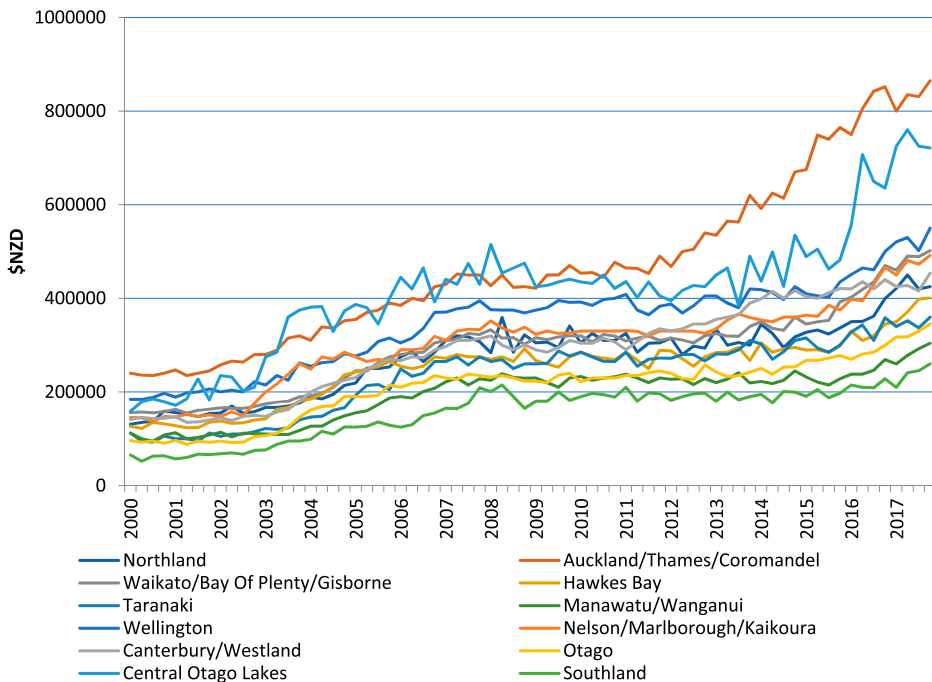
Figure 2. Regional house prices in New Zealand, 2000–17.
Source: Authors' calculations using REINZ data.

RESULTS AND DISCUSSION

Median house price trends across regions of New Zealand, shown in Figure 2, demonstrate an important skew. Auckland experienced a steady incline from NZ$240,000 in 2000 to NZ$430,000 in 2010, followed by a plateau after the global financial crisis, then moving into a steeper incline to NZ$870,000 by 2017. There was effectively a doubling of house prices over a seven-year period for the dominant Auckland region. The Central Otago Lakes, which contains Queenstown, saw significant house price increases following the global financial crisis from approximately NZ$400,000 rising to NZ$750,000 in 2017, but this region's housing market, where demand is typically driven by second homes, is more volatile due to a lower quantity of housing stock compared with the Auckland region. Most other regional housing market prices have risen at a relatively uniform rate with a few exceptions, such as Waikato whose juxtaposition to the Auckland region has enabled it to take some of the heat from Auckland.

Inspection of Figure 3 reveals that regional wage rates have been on an upward trend. Central Otago Lakes has the lowest wage compared with the rest of New Zealand's regions, especially when set against its high house prices (Figure 2). Average weekly earnings in Central Otago Lakes have risen from approximately NZ$600 in 2000 to approximately NZ$900 in 2017. Central Otago Lakes also demonstrates some wage volatility, arguably due to its seasonal labour force associated with being a tourist destination. Of similar interest is the average wage climb in the Taranaki region, which saw an increase in average wage from NZ$650 in 2000 to have the second highest average regional wage at NZ$1400 in 2017, and this region's port/oil industry may have an important influence here. It is pertinent to see that Wellington has the highest wages, despite many general core industries being located in Auckland; the high and uniform climb of wages in Wellington to almost NZ$1300 is emblematic of a more stable workforce in the public service,

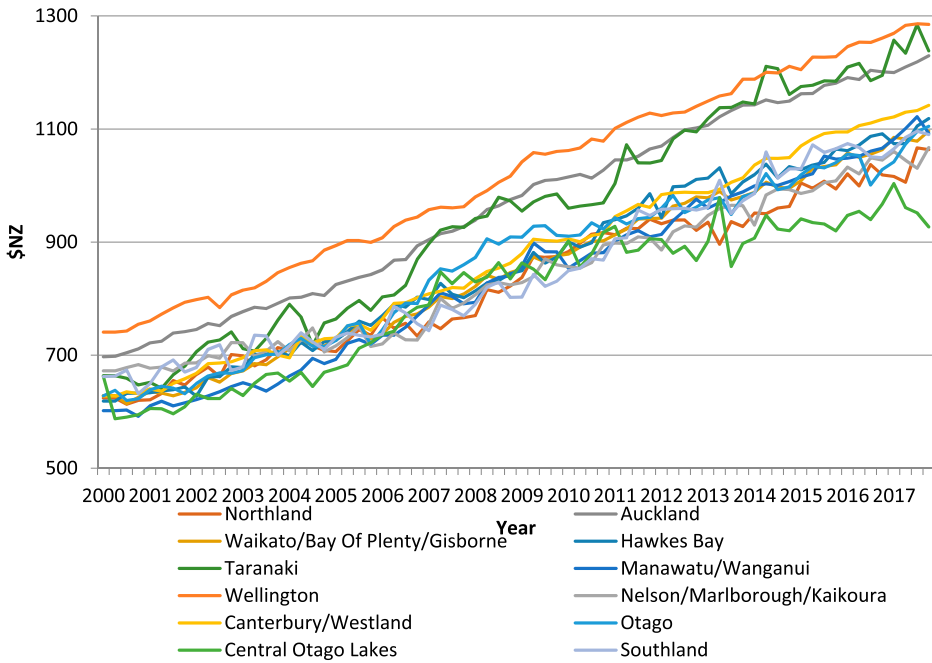**Figure 3.** Wages in New Zealand regions, 2000–17.
Source: Authors' calculations using Statistics New Zealand data.

academic and professional services sectors in Wellington, whereas Auckland and Central Otago Lakes have higher proportions of more casual employment, despite both regions experiencing steep house price acceleration.
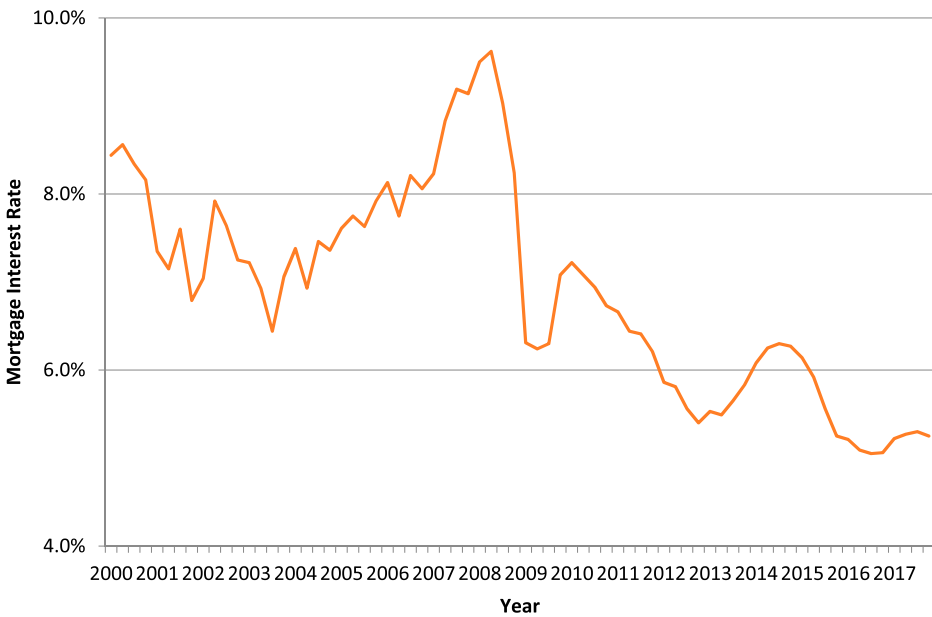

Figure 4. Mortgage rates in New Zealand, 2000–17.
Source: Authors' calculations.

There has been a downward trend in mortgage rates across New Zealand over the entire period under consideration (Figure 4). Within this general downward trend there was a mortgage rate rise from mid-2003 to 2008 when the effects of the global financial crisis took the rate steeply downwards from approximately 9.5% to 6.5%. This steep fall was followed by steady cyclical declines containing two peaks of approximately 7% in 2010 and 6% in 2014–15. Low interest rates are argued to be major factor affecting housing affordability.

The final stage of data description concerns the change in the affordability of house prices, as shown in Figure 5. The vertical axis is calibrated to illustrate the extent of the change in affordability every three months; a positive value implies that affordability improved over the three-month period because of a faster rate of increase in wages than in house prices, whereas a negative value implies that houses became less affordable over a three-month period because house prices rose at a faster rate than wages. The x-axis is calibrated so that the period is time centred around the end of 2008/beginning of 2009. Figure 5 illustrates that average regional year-on-year affordability fell sharply in the early 2000s, slowed after 2003 and continued to fall until the global financial crisis during which affordability began to improve. This improvement in average regional house price affordability continued until 2011, after which it began to decline again. Figure 5 therefore illustrates how a market increases its rate of change as we approach the global financial crisis until it plateaus and then declines following the global financial crisis. To delve more deeply into these trajectories, we now turn to our main findings concerning trajectories of regional housing affordability and whether mortgage rates and the global financial crisis affected New Zealand's regions symmetrically.

Trajectory regressions

To identify trajectories of regional house price affordability, we apply Nagin's (2005) trajectory regression approach to identify regions that followed similar paths of affordability over time. It is then possible to identify whether groups of regions were affected asymmetrically by mortgage interest rate adjustments and if the global financial crisis affected house price affordability differentially between groups of regions.

Application of this approach revealed four groups of regions that followed distinctly different trajectories with respect to house price affordability, as shown in Figure 6, and with group membership and explanations provided in Table 1. Group 1 contains the regions of 'Auckland' and
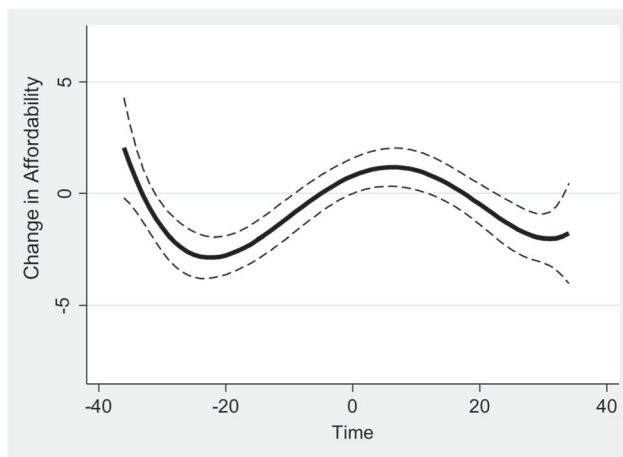

Figure 5. Housing affordability growth.
Source: Authors' calculations using Massey University's Home Affordability Index data.
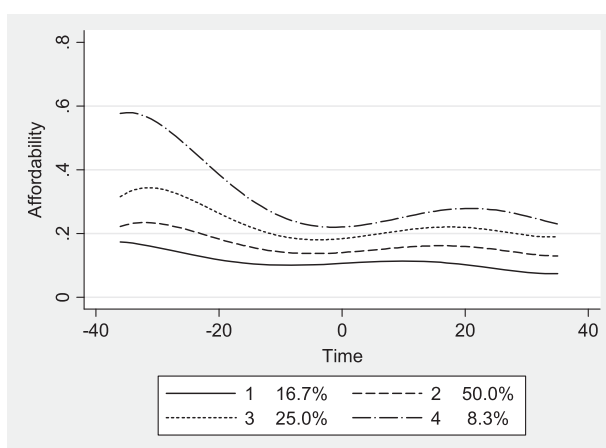
Figure 6. New Zealand housing affordability rate of change trajectory groups.
Source: Authors' calculations using Massey University's Home Affordability Index data.

'Central Otago Lakes' and, as argued above, they have both experienced significant house price rises and are the least affordable regions in New Zealand. Group 2 contains the bulk of New Zealand's regions, and this group forms a cluster arguably on account of being within commutable distance to core labour markets and have significant but secondary housing markets. The third group of regions is located at a significant distance from the main labour markets, making it impractical for many to commute to core markets, and have collectively lower house prices. The fourth group contains just one region, Southland, which stands out as a unique region at the extreme southern point of New Zealand's South Island, marking it out as a geographically isolated region with house prices considerably below the national average.

Figure 6 reveals that the cycles of housing affordability are experienced to different extents across New Zealand with Auckland's trajectory group (group 1) experiencing, in relative terms, a relatively flat downwards trajectory, but this should be understood in context because a reduction in affordability from 0.10 to 0.09 is associated with a reduction in affordability

Table 1. Trajectory groups and explanations.

Group	Region(s)	Grouping explanation
1	Auckland/Thames/ Coromandel Central Otago Lakes	High unaffordability
2	Canterbury/Westland Hawkes Bay Nelson/Marlborough/ Kaikoura Northland Waikato/Bay of Plenty Wellington	Significant secondary housing markets with proximity to core labour markets
3	Manawatu/Wanganui Otago Taranaki	Often more affordable housing markets, but with less proximity to core labour markets
4	Southland	Geographically isolated region of the South Island with house prices considerably below the national average

Source: Authors' calculations using Massey University's Home Affordability Index data.

from an average house price that falls from 10 times its regional average salary to 11 times its regional average salary.[3]

Group 4 (Southland only) experienced the greatest fall in affordability over this period. Southland experienced the sharpest fall in affordability before the global financial crisis from a starting position where annual regional wages (Figure 2) were over 50% of the average house price in 2000 (Figure 1). Although affordability fell in Southland substantially, annual wages remain greater than 20% of the average house price (Figures 1 and 2). House prices in this area converged towards other groups in the early 2000s (Figure 1), probably because house prices in Southland rose at a faster percentage rate than in other groups.

The results reveal commonalities across the four groupings immediately after the global financial crisis, with greater similarity in the slopes of the trajectories and even a slight improvement in affordability; during this period wages were growing faster than house prices (Figure 2). After these improvements in house price affordability, affordability began to drop first in the most unaffordable region (group 1) and last in the least affordable region (group 4). After their respective turning points on Figure 4, affordability continued to decline across all regions up to the end of the period under scrutiny.

How sensitive were these groups' trajectories to the global financial crisis?

We now turn to investigate whether the global financial crisis affected house price affordability differentially across the regional groups; these results are presented in Table 2. In this case we are using a dummy variable to represent the time period after the start of the global financial crisis until the end of the time period under examination; the reason for instrumentalizing the effect of the global financial crisis as a intercept change is that we do not know if and when the effect of the global financial crisis on house price affordability came to an end and whether this end occurred differentially across groups of regions.[4]

Table 2 presents the coefficient and standard error estimates of the shift intercept in the trajectory regression model and whether each trajectory shifted to a statistically significant subsequent to the global financial crisis. The estimates illustrate that the global financial crisis did make a statistically significant improvement in the affordability of house prices for groups 2 and 3 but not for groups 1 and 4. These results suggest that house price affordability in the most disconnected region (group 4) was not significantly sensitive to global financial pressures, perhaps because wages and house prices are determined locally without strong influence from major centres of population or from overseas. The lack of a statistically significant effect of the global financial crisis on housing affordability in the highly unaffordability regions (group 1) suggests the presence of other regional-specific factors that shape house price affordability there, such as a social desirability bias (Foye et al., 2017) or buy-to-rent investments with relatively safer rental incomes (Jordà et al., 2017). In contrast, regions with secondary housing markets with good labour market access (group 2) and regions with more affordable and less proximity to core labour markets (group 3) both experienced the greatest improvements in

Table 2. Global financial crisis regression results.

	Trajectory group				Bayesian information criterion (BIC)	Akaike information criterion (AIC)
	1	2	3	4		
Global financial crisis	0.001 (0.009)	0.011** (0.005)	0.029*** (0.007)	−0.016 (0.012)	2188	2264

Note: The BIC and AIC are commonly used for model selection in finite sets of models. In this model, their values were 2188 and 2264, respectively.
Source: Authors' estimations.

Table 3. Mortgage rate regression results.

Mortgage rate	Trajectory group			
	1	2	3	4
0 quarter lag	−0.000	−0.002	0.002	−0.001
1 quarter lag	0.001	−0.001	0.002	−0.002
2 quarters lag	0.000	−0.001	0.002	−0.000
3 quarters lag	0.000	−0.001	0.002	−0.001
4 quarters lag	0.000	−0.001	0.002	−0.001

Note: In these models, the Bayesian information criterion (BIC) and Akaike information criterion (AIC) values for 0 quarter lag in mortgage rates were 2177 and 2253, respectively. Their values for 1, 2, 3 and 4 quarter lags in mortgage rates were 21,660 and 2236; 2142 and 2218; 2113 and 2189; and 2098 and 2173, respectively.
Source: Authors' estimations.

affordability. We can postulate that these improvements in affordability are perhaps due to a drop in demand, which reduced the upward pressure on house prices.

How sensitive were these regional groups' trajectories to mortgage rate adjustments?

We now analyse the effect of mortgage rate adjustments on house price affordability. Table 3 presents the trajectory regression estimates of the effects of mortgage rates with various temporal lags on affordability. All coefficients are insignificantly different from zero, suggesting that over this time period changes in the mortgage rate had no statistically significant effect on the housing affordability trajectories of any of the regional groups irrespective of the length of time lag (0–4 quarters).

The results presented in Table 3 illustrate that house price affordability across the regions of New Zealand over the period 2000–17 was insensitive to changes in mortgage interest rates. Whether affordability was driven by other factors is worthy of future research. For instance, affordability could have been driven by easy-to-access finance, positive status effects associated with home ownership, buy-to-rent investment incentives, the dominance of Australian banks in the New Zealand economy, other ineffective policies or possibly some other factor(s).

CONCLUSIONS

The evolution of house price affordability is an important issue to understand for governments, academics and the general public alike. Understanding why, when and how people decide to purchase a house and whether they are sensitive to hitherto understood levers of government monetary policy is important if effective policies are going to be formed that can take the heat out of an inflating housing market.

This paper adopted a novel approach to analysing house price affordability dynamics across regions of New Zealand to identify if there are groups of regions that have followed similar trajectories over time, and to understand if these groups of regions were affected symmetrically by the global financial crisis and the evolution of mortgage rates.

First, we presented a visualization of the intrinsic connectivity and considerable change of house prices, wages and interest rates between 2000 and 2017. House prices followed an upward trajectory, with exponential increases since the global financial crisis in the dominant labour and housing market of the Auckland region and the more seasonal tourist labour and investment/second home market in the Central Otago Lakes region (including Queenstown). Wages also took a similar upward trend although at a disproportional rate to house prices, with high wages in the regions of Wellington

(the public and services capital) and the Taranaki region (which has a significant oil and gas port). Wage differentials in Auckland are also high, particularly in relation to the Central Otago Lakes region that has the lowest average wage levels of any New Zealand region between 2013 and 2017. Regional variations in house prices and wages were marked against a national mortgage interest rate that has seen a decline since the global financial crisis through to 2017.

Second, we divided average wage levels by median house prices at the regional level to form a regional house price affordability index. Analyses of this index reveals signs of upward or downward growth. At a national aggregate scale, we demonstrated that affordability fell until the global financial crisis, plateaued and recovered, only to be followed by further declines.

Third, to identify whether house price affordability changed at a uniform rate across regions or if certain groups of regions experienced evolutions that were different to other regions, we applied a trajectory regression approach to group regions into similar evolutionary paths. A most prominent trajectory was followed by the more geographically isolated region of Southland which followed a path where affordability was significantly higher relative to the other three groups, especially leading up to the global financial crisis. We also observe further but less protracted asymmetries in the evolution of housing affordability for the other groups after the global financial crisis.

Fourth, we explored whether the global financial crisis affected groups of regions equally, and reveal that housing affordability was not significantly affected in the core labour market but highly unaffordable region of Auckland and the investment/second home dominant region of the Central Otago Lakes (including Queenstown). In contrast, two regions were affected significantly by the global financial crisis in New Zealand: one characterized as a secondary housing market with labour market access and the other characterized as a more affordable and less proximity to core labour markets.

Finally, we explored whether the regional house affordability trajectories were sensitive to mortgage rate changes (immediate or temporally lagged by up to one year) and revealed a degree of irrelevance, as no group's housing affordability trajectory was statistically significantly affected by the mortgage rate. These findings provide a basis from which to question the adequacy of mortgage rates to deflate house affordability bubbles in New Zealand. Mortgage interest rate changes could be responding more to other global and regional monetary forces, whereas housing affordability could now be more in tune with conspicuous consumption activities that housing wealth affords.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

NOTES

[1]   Data on house prices and wages are aggregated at a regional scale. Thus, note the statistical geographical units that relate to the regions. There are point data for specific location sales on a plot or parcel. In collecting these point data, a meshblock is the smallest geographical unit for which statistical data are collected by Statistics New Zealand. Meshblocks usually contain a population of approximately 200–300 people, though this can vary due to industrial/commercial areas, population changes and other factors. Meshblocks aggregate to build larger geographical areas, such as area units, territorial authorities and regional councils. The total number of meshblocks nationally usually increases with each census due to population changes. As of the 2013 census, there are 46,637 meshblocks in New Zealand (CoreLogic, 2019). Census area units are an aggregation of meshblocks, similar in size to a suburb; however, they do not align to suburb boundaries. In urban areas the population of an area unit is approximately 3000–

5000 people. There are over 2000 area units in New Zealand. Territorial authorities are the second tier of local government in New Zealand, below regional councils. There are 67 territorial authorities: 12 city councils, 53 district councils, Auckland Council and Chatham Islands Council. Auckland data have previously used council boundaries, as opposed to the now Auckland Super City boundary. The administration layer includes local and central government administrative zoning such as territorial authority boundaries, regional councils, electoral boundaries and Statistics New Zealand boundaries such as meshblocks. Other data included are the New Zealand Fire Service localities (most commonly used suburb definitions), postcodes and school zones (CoreLogic, 2019).

2   The agency notes that there may be irregularities in the data resulting from errors in the returns or processing, but when individual returns are combined with those of other agencies, the distortion is likely to be small. In some months there may be fewer transactions and this can result in median prices that are open to question. These variances are considered unavoidable given a data set that covers all transactions for New Zealand. In extreme cases, a set of wayward median observations could affect the paths of the estimated trajectories, but the results presented here are in line with analytical expectations and future research could establish whether median observations are a statistical concern. The limitation of excluding transaction counts is accepted for this paper and a recommendation for future research.

3   Specifically, the reduction in affordability is from 0.1000 to 0.0909.

4   When a longer time period of data is available after the global financial crisis, then this effect could be explored in more depth.

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